

# ST7997 Oil Burner Mounted Electric Fan Timer

## INSTALLATION INSTRUCTIONS

### APPLICATION

The ST7997 Oil Burner Mounted Electric Fan Timer integrates control of burner and circulator fan operations in an oil furnace and is the central wiring point for most electrical components in the furnace. The ST7997 mounts on a standard four-inch by four-inch junction box typically located on the oil burner. When used with the R7997 Integrated Oil Primary Controller and Ignitor, it provides simplified wiring and field serviceability. The basic purposes of the ST7997 are to monitor the thermostat for heat, cool and fan demands, run the oil burner primary control and run a two-speed circulating fan, as required. The ST7997 also monitors a limit switch string that energizes the circulating fan when the limit switch opens.

The ST7997 provides electronic air cleaner (EAC) and humidifier (HUM) terminal connections for field installation convenience.

### SPECIFICATIONS

#### Electrical

##### Input Ratings

###### Supply Voltage:

102 to 132 Vac (120 Vac nominal), 60 Hz.

###### Supply Current:

100 mA maximum without loads connected to outputs.  
20A maximum with loads connected to outputs.

##### Output Ratings:

###### Relay Contacts:

Circulator Heat or Cool Blower Speed Rating: 15A Full Load Amperage (FLA) (0.75 pF)/30A Locked Rotor Amperage (LRA) (0.5 pF).

NOTE: FLA rating is reduced by EAC load.

###### EAC:

1A maximum.

###### Circulator Continuous Blower Speed Rating:

8A FLA (0.75pF)/16A LRA (0.5pF).

###### Humidifier:

1A maximum.

###### Limit:

10A maximum.

###### L1/L2 (Burner):

20A maximum.

###### Thermostat Current:

Heat Mode: 100 mA (R7997 supplied).

Cool Mode: Cooling contactor load 500 mA maximum (ST7997 supplied).

###### Cooling Contactor:

2 VA minimum, 12 VA maximum.

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###### Fuse:

1A (automotive type ATO).

###### Delay Timings:

Heat On Delay: 45 or 60 seconds (fixed or field selectable via DIP switch optional position 3).

Heat Off Delay: 60/100/120/150 seconds (four field selections via DIP switch positions 1 and 2).

Cool On/Off Delay: 0/0 or 30/30 seconds (fixed).

###### Delay Timing Tolerances:

±5 seconds or ±20 percent, whichever is greater.

#### Environmental

##### Temperature Ranges:

Operating: -40°F (-40°C) to +150°F (66°C).

Storage: -20°F (-29°C) to +150°F (66°C).

##### Humidity:

90 percent relative humidity at 95°F (35°C), noncondensing.

##### Approvals:

Underwriters Laboratories Inc. Component  
Recognized: File 353.

Canadian Underwriters Laboratories inc. Component  
Recognized: Pending approval.

#### Mechanical:

##### Dimensions (Fig. 1):

4-9/32 in. (109 mm) long by 4-1/4 in. (108 mm) wide by 3-27/32 (97 mm) high. See Fig. 1.



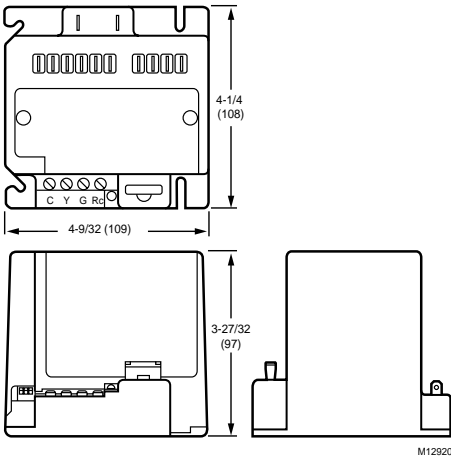


Fig. 1. ST7997A,B Oil Burner Mounted Electric Fan Timer dimensions in in. (mm).

**Mounting:**

Mounts directly on standard 4 in. (102 mm) by 4 in. (102 mm) junction box.

**Packaging:**

Unit pack and bulk pack.

**Connections:**

- R7997, Oil Burner Motor, Oil Valve and Power (L1, L2): Six (6) 1/4 in. (6 mm) by 1/32 in. (0.8 mm) quick connects pass through recessed cover on bottom of case.
- Circulator Blower (Neutral, Heat, Cool, Continuous), Limit (Hot, Limit): One six-position Molex® in-line connector flush with top of case or six 1/4 in. (6 mm) by 1/32 in. (0.8 mm) quick connects individually recessed in top of case.
- Humidifier: Two 1/4 in. (6 mm) by 1/32 in. (0.8 mm) quick connects individually recessed in top of case.
- Electronic Air Cleaner: Two 1/4 in. (6 mm) by 1/32 in. (0.8 mm) quick connects individually recessed in top of case.
- Thermostat/Cooling Contactor: Four No. 4 screw terminals marked Rc, Y, G and C on front side of case.

**INSTALLATION**

**When Installing this Product...**

1. Read these instructions carefully. Failure to follow them can damage the product or cause a hazardous condition.
2. Check the ratings and specifications given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out the product operation as provided in these instructions.

**⚠ WARNING**

**Electrical Shock Hazard**

**Can cause serious injury or death.**

Disconnect power supply before wiring to prevent electrical shock or equipment damage.

**Location and Mounting**

Mount the ST7997 on the oil burner 4 in. (102 mm) by 4 in. (102 mm) junction box compartment using four No. 6 screws (obtained locally). See Fig. 2.

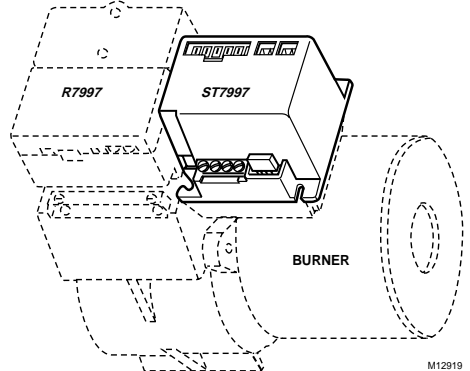


Fig. 2. ST7997A,B Oil Burner Mounted Electric Fan Timer typical installation.

**IMPORTANT**

*The ST7997 requires a mechanical or electronic (power-stealing or battery-powered) five-wire thermostat with independent heat/cool circuits (R, W, Rc, Y, G).*

**Wiring**

All wiring must comply with local codes and ordinances. Refer to Fig. 3 for standard wiring connections and Fig. 4 for units with pre- and post purge.

Make wiring connections within the oil burner junction box for applications requiring power-venting. Add a 4 in. by 4 in. (102 mm by 102 mm) junction box, at least 1/2 in. (13 mm) deep between the ST7997 and the oil burner junction box. See Fig. 5 for wiring diagram showing airflow switch and power vent motor.

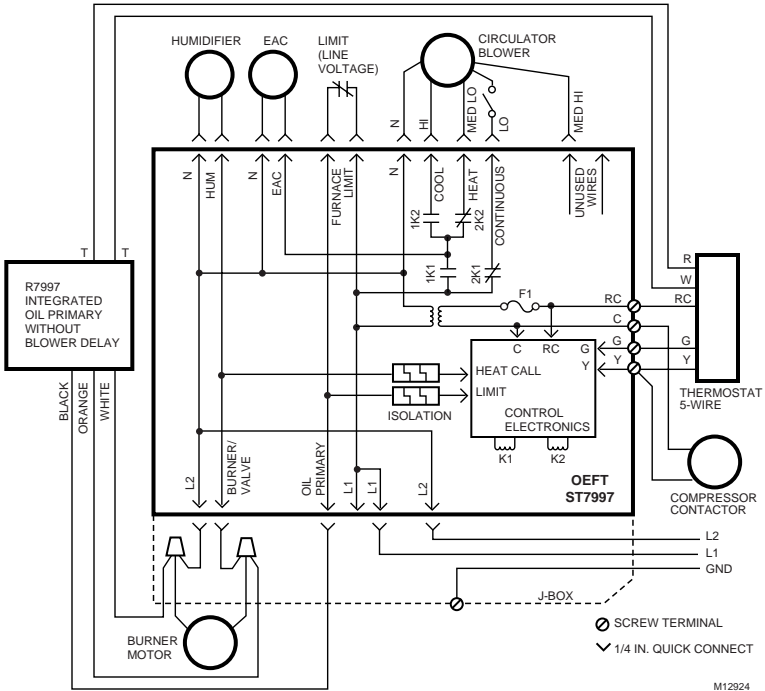


Fig. 3. ST7997 Oil Burner Mounted Electronic Fan Timer standard wiring connections.

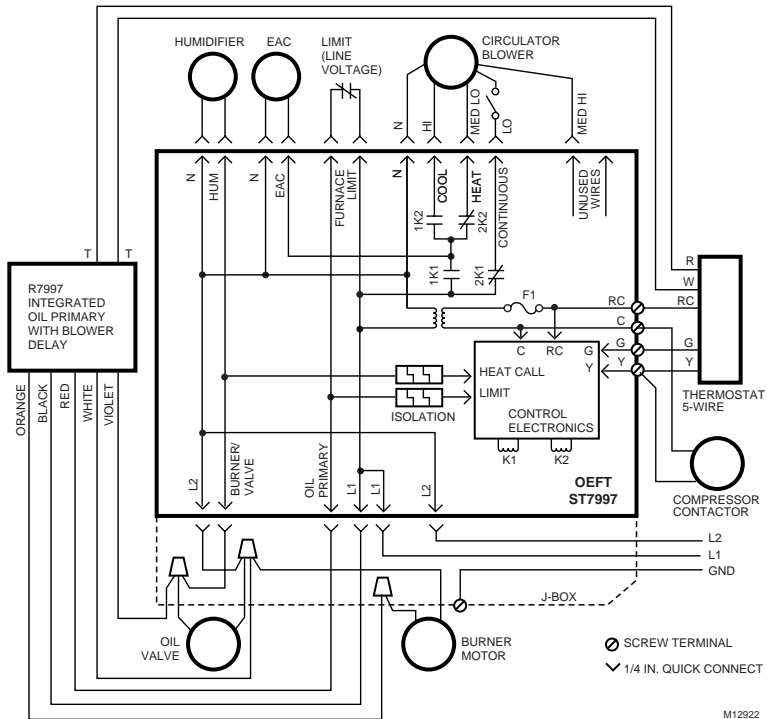


Fig. 4. ST7997 Oil Burner Mounted Electronic Fan Timer wiring for units with pre- and post purge.

**NOTE:** Two dummy quick connect terminals, labeled "unused wires", not connected to the ST7997 circuitry, are provided on the back of the case to hold unused wires from the circulation blower motor speed taps.

**IMPORTANT**

Field changes to the speeds (low, medium low, medium high, high) of the ST7997 blower modes (heat, cool, or continuous fan) can be made to models using Molex® connectors by cutting speed wires and splicing in an unused lead in accordance with local and national codes.

**Wiring Options**

Wiring options are listed in Table 1.

**Setting the Heat Fan-Off and Heat Fan-On Delay Switches**

Set the Heat Fan-Off delay switches to 60, 90, 120 or 150 seconds. See Fig. 6. The off delay time starts when the burner motor is de-energized at the end of a thermostat call for heat.

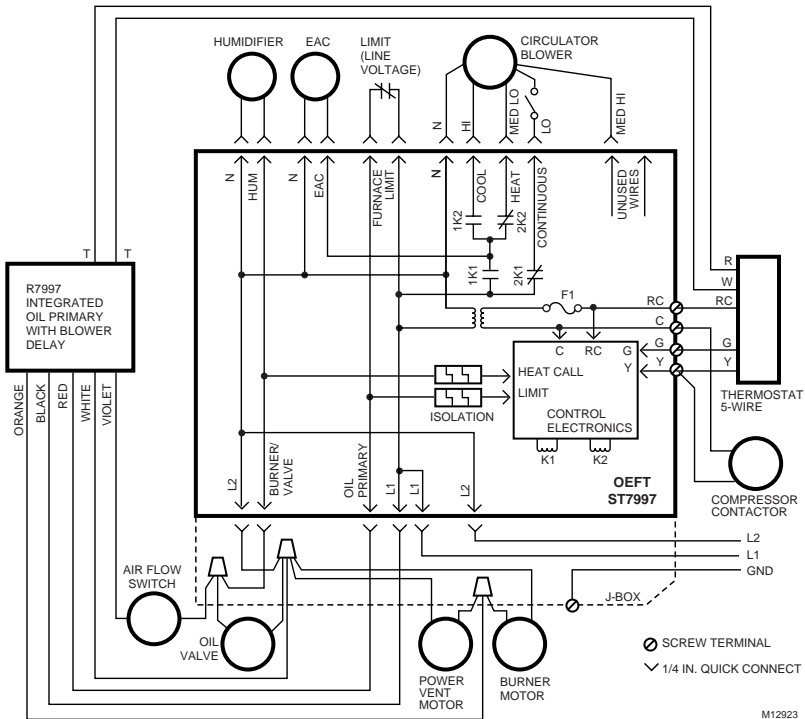
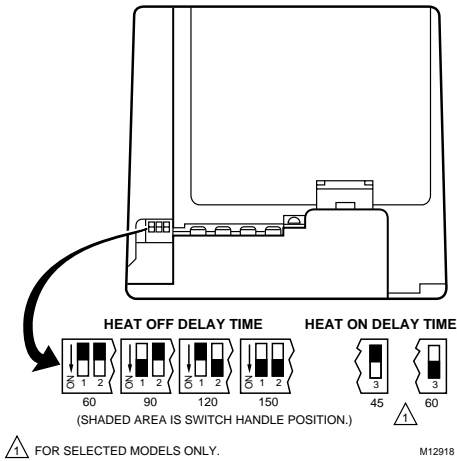


Fig. 5. ST7997 Oil Burner Mounted Electronic Fan Timer airflow switch and power vent motor for power venting wiring.

Table 1. ST7997 Wiring Options.

Mode	Action	System Response
OPTIONS	Constant circulating fan is connected. (Optional connectors are available for separate circulating fan speed tap.)	a. Circulating fan is energized at low speed when there is no call for heat, cool or fan. b. If fan operation is required by a call for heat, cool or fan, the ST7997 switches off the continuous fan speed tap before energizing the other fan speed.
	Electronic air cleaner is connected. (Optional connectors are available for 120 Vac electronic air cleaner.)	Electronic air cleaner (EAC) connections are energized when the heat or cool speed of the circulating fan is energized. EAC connections are not energized when the optional continuous fan terminal is energized.  NOTE: If continuous fan option is selected, connect EAC to line voltage input (L1).
	Humidity control is connected. (Optional connectors are available for 120 Vac humidifier.)	Humidifier connections are energized when burner motor is energized on standard models and when oil valve is energized on purging models.



**Fig. 6. ST7997 Fan Timer location and settings for Heat Fan-Off and Heat Fan-On delay switches.**

## CHECKOUT

Verify system operation by running the system through one complete heating and cooling cycle, if applicable. Troubleshoot by checking for appropriate voltages at the ST7997 terminals controlling the burner motor and heat and cool circulating fan. The ST7997 schematic (Fig. 3) shows internal switching to clarify operation and assist in troubleshooting. Table 2 provides the ST7997 operating sequence.

Use the green diagnostic LED to assist in troubleshooting:

- Off when system is on and thermostat is satisfied.
- On continuously when ST7997 recognizes a valid call for cool or fan from the thermostat and/or a valid call for heat from the R7997.
- Blinks rapidly on and off when limits are opened.

Table 2. ST7997 Operating Sequence.

Mode	Action	System Response
HEAT	Thermostat calls for heat. (W terminal is energized.)	<ul style="list-style-type: none"> <li>a. Thermostat calls for heat (closes oil primary control T-T connections.</li> <li>b. Ignition system and oil primary control start the furnace. Oil flows as long as oil primary senses flame.</li> <li>c. Burner motor is energized, LED turns on, and heat fan on delay timing begins. When timing is complete the circulating fan is energized at heat speed and warm air is delivered to the controlled space.</li> </ul>
	Thermostat ends call for heat.(W terminal is de-energized.)	<ul style="list-style-type: none"> <li>a. Oil primary control is de-energized, terminating the burner cycle, and LED turns off.</li> <li>b. Heat fan-off delay timing begins. When timing is completed, the circulating fan is de-energized.</li> <li>c. ST7997 returns to standby mode (oil primary control and circulating fan are off, unless continuous fan operation is selected at the thermostat).</li> </ul>
	Burner fails to light.	<ul style="list-style-type: none"> <li>a. Oil primary control locks out within lockout timing (timing depends on oil primary control).</li> <li>b. Burner motor is de-energized and LED turns off (even though the thermostat is still calling for heat).</li> <li>c. If heat fan has started, it continues through the selected heat-fan-off delay period.</li> </ul>
	Established flame fails.	<ul style="list-style-type: none"> <li>a. Burner motor is de-energized, LED turns off, and oil primary control goes into recycle mode.</li> <li>b. If selected heat fan-off delay timing is longer than the recycle delay timing, the heat fan continues to run through the next trial for ignition.</li> </ul>
COOL	Thermostat begins call for cool. (G and Y terminals are energized.)	<ul style="list-style-type: none"> <li>a. Cooling contactor is energized and LED turns on immediately.</li> <li>b. Circulating fan is energized at cool speed when cool on-delay time is complete.</li> </ul>
	Thermostat ends call for cool. (G and Y terminals are de-energized.)	<ul style="list-style-type: none"> <li>a. Cooling contactor is de-energized and LED turns off immediately.</li> <li>b. Circulating fan turns off when cool fan off-delay time is complete.</li> </ul>
FAN	Thermostat begins call for fan. (G terminal is energized.)	<ul style="list-style-type: none"> <li>a. Circulating fan is energized immediately at heat speed and LED turns on immediately.</li> </ul>
	Thermostat ends call for fan.(G terminal is de-energized.)	<ul style="list-style-type: none"> <li>a. Circulating fan is de-energized and LED turns off immediately.</li> </ul>
LIMIT	Limit switch string opens.	<ul style="list-style-type: none"> <li>a. LED flashes at 2 Hz rate (1/4 second on/off).</li> <li>b. Oil primary control shuts off burner.</li> <li>c. Circulating fan is energized immediately at heat speed.</li> </ul>
	Limit switch string closes (with existing call for heat).	<ul style="list-style-type: none"> <li>a. Oil primary control is energized, initiating burner lightoff and LED changes to continuously on.</li> <li>b. Circulating fan continues to operate at heat speed.</li> </ul>
	Limit switch string closes (without existing call for heat).	<ul style="list-style-type: none"> <li>a. LED turns off.</li> <li>b. Circulating fan turns off when heat fan-off delay time is complete.</li> <li>c. Normal operation resumes; device is in standby awaiting next thermostat command.</li> </ul>

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